Fact Sheet

DRAIN WATER FROM UNSATURATED SOILS

PROBLEM

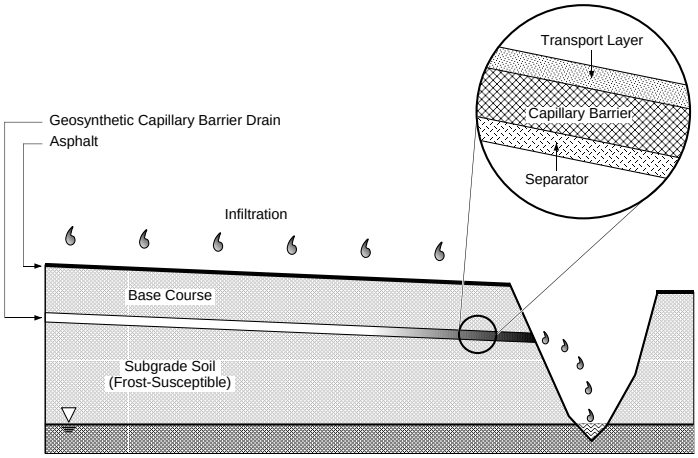
Drainage of water from geotechnical projects is almost always designed for the saturated flow of water in soil. However, the positive pore pressures associated with saturation often cause damage. In pavements, positive water pressures in the base or subgrade reduce strength and lead to rutting, heaving, and cracking. Moisture that moves upward in unsaturated, fine-grained soil (capillary action) in response to freezing or evaporation is also a problem, leading to deposition of salts at or near the soil surface, or frost heave in cold regions.

SOLUTION

CRREL and Dr. John Stormont of the University of New Mexico invented the Geocomposite Capillary Barrier Drain (GCBD) to drain water from soils while the water is subjected to negative pore water pressures, i.e., prior to the development of positive pore water pressures associated with saturation, while also preventing the upward capillary migration of water across the GCBD. The GCBD comprises three layers that are, from top to bottom, a *transport* layer (a specially designed or selected geotextile), a *capillary barrier* layer (a geonet), and a *separator* (geotextile).

In work supported by the NCHRP IDEA program (http://www4.trb.org/trb/dive.nsf/web/idea_programs), testing on a pavement test section has proven that the GCBD can (1) minimize the time that bases are saturated and (2) divert large volumes of water through the transport layer to a drainage system before reaching the subgrade. At long-term infiltration rates (0.15 mm hr^{-1}), the GCBD drained all water from the base of a test pavement section in which the asphalt was cracked, and did so while the water was at a negative pressure, preventing any water from reaching the subgrade. For infiltration of 9.5 mm in one hour, the GCBD prevented any water from reaching the subgrade (about 80% of the water ran off the pavement).

The transport layer of the GCBD needs further development to make a more economical product. We are seeking industry partners to work with us to develop and commercialize the GCBD, as well as transportation agencies that would like to cooperate in testing this technology in the field.



POINT OF CONTACT

Dr. Karen S. Henry
603-646-4100
Fax: 603-646-4640
E-mail: Karen.S.Henry@erdc.usace.army.mil

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US Army Corps of Engineers®
Cold Regions Research & Engineering Laboratory

CRREL, 72 Lyme Road, Hanover, NH 03755-1290
http://www.crrel.usace.army.mil